

# Sertifikaat

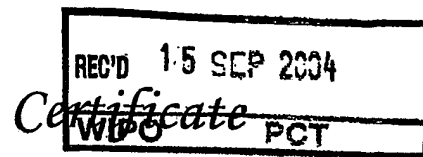
REPUBLIEK VAN SUID AFRIKA

PATENT KANTOOR  
DEPARTEMENT VAN HANDEL  
EN NYWERHEID



REPUBLIC OF SOUTH AFRICA

PATENT OFFICE  
DEPARTMENT OF TRADE AND  
INDUSTRY



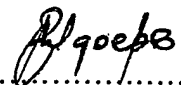
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This is to certify that

IB04/051062

- 1) South African Provisional Patent Application No. **2003/5146** accompanied by a Provisional Specification was originally filed at the South African Patent Office on **2 July 2003**, in the name of **DENEL (PTY) LTD** in respect of an invention entitled: "**Ammunition Loading Assembly**".
- 2) The photocopy attached hereto is a true copy of the provisional specification and drawings filed with South African Patent Application No. **2003/5146**.

Geteken te **PRETORIA** in die Republiek van Suid-Afrika, hierdie  
Signed at in the Republic of South Africa, this

26<sup>th</sup> dag van July 2004  
day of

  
.....  
Registrar of Patents

**PRIORITY  
DOCUMENT**  
SUBMITTED OR TRANSMITTED IN  
COMPLIANCE WITH RULE 17.1(a) OR (b)

REPUBLIC OF SOUTH AFRICA

PATENTS ACT, 1978

## REGISTER OF PATENTS

OFFICIAL APPLICATION NO.		LODGING DATE : PROVISIONAL		ACCEPTANCE DATE	
21	01 2003/5146	22	2 July 2003	43	
INTERNATIONAL CLASSIFICATION		LODGING DATE : COMPLETE		GRANTED DATE	
51		23			
FULL NAME(S) OF APPLICANT(S) / PATENTEE(S)					
71	DENEL (PTY) LTD				
APPLICANTS SUBSTITUTED :				DATE REGISTERED	
71					
ASSIGNEE(S)				DATE REGISTERED	
71					
FULL NAME(S) OF INVENTOR(S)					
72	JOUBERT, Francois, Alwyn				
PRIORITY CLAIMED		COUNTRY		NUMBER	
N.B. Use International abbreviation for country. (See Schedule 4)		33		31	
TITLE OF INVENTION					
54	AMMUNITION LOADING ASSEMBLY				
ADDRESS OF APPLICANT(S) / PATENTEE(S)					
368 Selbourne Avenue Centurion PRETORIA 0182 South Africa					
ADDRESS FOR SERVICE				REF	
74	D M Kisch Inc, 54 Wierda Road West, Wierda Valley, SANDTON				P25537ZA00
PATENT OF ADDITION NO.		DATE OF ANY CHANGE			
61					
FRESH APPLICATION BASED ON		DATE OF ANY CHANGE			

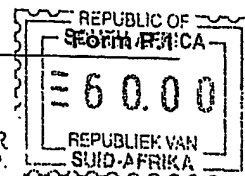
**REPUBLIC OF SOUTH AFRICA**  
**PATENTS ACT, 1978**

**APPLICATION FOR A PATENT AND ACKNOWLEDGEMENT OF RECEIPT**  
(Section 30 (1) - Regulation 22)

The grant of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate.



FBHR  
229



OFFICIAL APPLICATION NO	
21	01 <b>2003/5146</b>

DMK REFERENCE
P25537ZA00

FULL NAME(S) OF APPLICANT(S)
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71	DENEL (PTY) LTD
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ADDRESS(ES) OF APPLICANT(S)
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	368 Selbourne Avenue Centurion PRETORIA 0182 South Africa
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TITLE OF INVENTION
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54	AMMUNITION LOADING ASSEMBLY
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	THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANING FORM P2 The earliest priority claimed is
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	THIS APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO.	21	01	
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	THIS APPLICATION IS FRESH APPLICATION IN TERMS OF SECTION 37 AND BASED ON APPLICATION NO.	21	01	
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THIS APPLICATION IS ACCOMPANIED BY :
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<input checked="" type="checkbox"/>	1a	A single copy of a provisional specification of 15 pages.	
	1b	Two copies of a complete specification of pages.	
<input checked="" type="checkbox"/>	2a	Informal drawings of 6 sheets.	
	2b	Formal drawings of sheets.	
	3	Publication particulars and abstract (form P8 in duplicate).	
	4	A copy of figure of the drawings for the abstract.	
<input checked="" type="checkbox"/>	5	Assignment of invention (from the inventors) or other evidence of title.	
	6	Certified priority document(s).	
	7	Translation of priority document(s).	
	8	Assignment of priority rights.	
	9	A copy of form P2 and a specification of S.A. Patent Application.	21 01
<input checked="" type="checkbox"/>	10	A declaration and power of attorney on form P3.	
	11	Request for ante-dating on form P4.	
	12	Request for classification on form P9.	
	13a	Request for delay of acceptance on form P4.	
	13b		

DATED 2 July 2003

ADDRESS FOR SERVICE	
74	D M Kisch Inc Inanda Greens Business Park 54 Wierda Road West Wierda Valley SANDTON

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Patent Attorney for Applicant(s)

RECEIVED
2003-07-02
OFFICIAL DATE STAMP
REGISTRAR OF PATENTS

The duplicate will be returned to the applicant's address for service as proof of lodging but is not valid unless endorsed with effect of date.

## REPUBLIC OF SOUTH AFRICA

## PATENTS ACT, 1978

## PROVISIONAL SPECIFICATION

( Section 30 (1) - Regulation 27 )

OFFICIAL APPLICATION NO.		LODGING DATE	DMK REFERENCE
21	01 2003/5146	22 2 July 2003	P25537ZA00

## FULL NAME(S) OF APPLICANT(S)

71

DENEL (PTY) LTD

## FULL NAME(S) OF INVENTOR(S)

72

JOUBERT, Francois, Alwyn

## TITLE OF INVENTION

54

AMMUNITION LOADING ASSEMBLY

## AMMUNITION LOADING ASSEMBLY

### INTRODUCTION AND BACKGROUND TO THE INVENTION

This invention relates to an ammunition loading assembly, a gun provided with  
5 such an ammunition loading assembly and a drive chain assembly for such an  
ammunition loading assembly.

A conventional flick rammer for loading a projectile into a barrel of a gun flicks  
the projectile, from a position outside the chamber, along the bore of the  
10 chamber into the bore of the barrel. A first disadvantage of such flick rammer is  
that, to enable engraving of the projectile in the barrel, concentric alignment of  
the projectile and the barrel is required, which is not always accurately  
achieved owing to the distance the projectile is flicked. This is aggravated at  
high elevations of the barrel.

15

A second disadvantage of the flick rammer is that if the energy with which the  
projectile is flicked into the barrel is insufficient, fall-back of the projectile occurs.  
This is especially so if the elevation of the barrel is greater than 45 degrees and  
where the concentric alignment of the projectile and barrel moves out of kilter  
20 during movement of the projectile along the chamber, resulting in the sides of  
the projectile bouncing against the insides of the chamber, thus reducing the  
kinetic energy thereof.

Furthermore, should the energy with which the projectile is flicked into the barrel be too much, bounce-back of the projectile occurs. Moreover, with a conventional flick rammer, the energy applied to the projectile is relatively difficult to control and the engraving depth of projectile is therefore inconsistent.

5

A further disadvantage of the conventional flick rammer is that it is not suitable for loading a charge into the chamber of the gun, as charges are often relatively soft and deform when flicked into the chamber. This could cause jamming of the breech.

10

US patent number 5,895,880 discloses a chain projectile rammer including a rammer pawl for engaging the base of a projectile with a rigidisable chain attached to the rammer pawl for providing reciprocating movement thereto. The rigidisable chain includes a plurality of rows of links having adjacent links pivotally attached to one another. A perimeter of each link enables fixed engagement of adjacent links on each row upon coordinated pivoting of adjacent links in each row. The perimeter of each link further enables release of the fixed engagement upon reverse coordinated pivoting of adjacent links. A drive is provided for reciprocally moving the chain and for pivoting adjacent links of the chain in order to rigidise the chain as the chain is moved in a forward direction and to unrigidise the chain when it is moved in a reverse direction.

20

A first disadvantage of this projectile rammer is that the construction of the chain is relatively complex making the chain prone to jamming. A second disadvantage is that ammunition rounds are not loaded into the barrel of the gun but into the breech, and is therefore suitable only for smaller calibre cased ammunition. Since the cased ammunition rounds are delivered only to the breech and not to barrel, the same disadvantages as to that of the flick rammer, discussed above are encountered with this type of rammer.

### **OBJECT OF THE INVENTION**

10 It is therefore an object of the present invention to provide an ammunition loading assembly, a gun provided with such an ammunition loading assembly and a drive chain assembly for such an ammunition loading assembly with which the aforesaid disadvantages can be overcome or at least minimised.

### **15 SUMMARY OF THE INVENTION**

According to a first aspect of the invention there is provided an ammunition loading assembly for loading a projectile into a barrel of a gun, comprising:

- an urging member for urging the projectile into the said barrel;  
and
- 20 - a drive means for driving the urging member between a projectile receiving position outside the barrel and a projectile delivery position inside the chamber of the gun, towards the proximate end of the barrel, the drive means including a drive chain

assembly, connected to the urging member for driving the urging member between the said projectile receiving and delivery positions.

- 5 Further according to the invention the drive chain assembly is rigid in all directions but one, the arrangement being such that the drive chain assembly pushes the urging member from the projectile receiving position to the projectile delivery position and pulls the urging member from the projectile deliver position to the projectile receiving position.

10

The drive means may further include a drive motor for driving the drive chain assembly.

- Further according to the invention, the ammunition loading assembly includes a
- 15 magazine for storing the drive chain assembly when the urging member is in the projectile receiving position.

- The magazine may define a curvilinear track along which the drive chain assembly moves when moving the urging member between the projectile
- 20 delivery position and the projectile receiving position.



The magazine may include a polymeric body defining the track and which is covered by metal cover plates defining an outlet for the chain assembly. Preferably the polymeric block is of polypropylene.

- 5 The polymeric body may be provided with metal reinforcing members having curved chain guiding faces located at corners of the track, for guiding the inner end of the drive chain assembly around such corners.

- 10 The drive chain assembly may be constituted of a plurality of chain links pivotally connected to each other; and each chain link may be provided with a retaining block for abutting the retaining block of a consecutive chain link for rigidising the drive chain assembly in all directions but one.

- 15 The arrangement may be such that when the drive chain assembly is bent in the said one direction, the retaining blocks are displaced from each other, and when the drive chain assembly is in a linear configuration, adjacent retaining blocks abut each other to limit bending of the drive chain assembly in all but said one direction.

- 20 The configuration of the retaining blocks may be such that, when the blocks abut each other, the drive chain assembly extends in a loose curve, the arrangement being further such that the drive chain assembly may be stressed by straightening the curve.

The retaining blocks may each comprise a base for connecting to a chain link and two abutment faces extending upwardly from the base, the configuration being such that the angle between the base and each abutment face is marginally greater than 90 degrees.

The drive motor may include a drive sprocket wheel for engaging the links of the drive chain assembly.

10 The ammunition loading assembly may further include a first chain-retaining device for limiting curving of the chain assembly out of its linear orientation, when moving the urging member towards the projectile delivery position, the first chain-retaining device is movable with the urging member from the projectile receiving position towards a position intermediate the projectile receiving and delivery positions, where it is retained from further movement by a retaining means.

The ammunition loading assembly may yet further include a second chain-retaining device, for guiding the chain when moving out of the magazine.

20

The first and second chain-retaining devices may each be provided with at least one sliding member for engaging an upper surface of the retaining blocks of the chain assembly.

The sliding members may each comprise one or more polypropylene bodies.

5 The second chain-retaining device is movable with the urging member in a direction towards the projectile delivery position, from a position proximate the outlet of the magazine to a position offset from the said outlet.

10 According to a second aspect of the invention there is provided a gun including an ammunition loading assembly according to the first aspect of the invention.

According to a third aspect of the invention there is provided a drive chain assembly for an ammunition loading assembly for loading a projectile into a barrel of a gun, the chain assembly comprising a plurality of chain links pivotally connected to each other; each chain link being provided with a retaining block  
15 for abutting the retaining block of a consecutive chain link for rigidising the drive chain assembly in all directions but one.

20 Further according to the invention, the arrangement is such that when the drive chain assembly is bent in the said one direction, the retaining blocks are displaced from each other, and when the drive chain assembly is in a linear configuration, adjacent retaining blocks abut each other to limit bending of the drive chain assembly in all but said one direction.

Yet further according to the invention, the configuration of the retaining blocks is such that, when the blocks abut each other, the drive chain assembly extends in a loose curve, the arrangement being further such that the drive chain assembly is stressed by straightening the curve.

5

The retaining blocks may each comprise a base for connecting to a chain link and two abutment faces extending upwardly from the base, the configuration being such that the angle between the base and each abutment face is marginally greater than 90 degrees.

10

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will now be described further by way of a non-limiting example with reference to the accompanying drawings wherein:

figure 1 is a longitudinal sectional side view of a barrel of a gun and of an ammunition loading assembly according to a preferred embodiment of the invention, with a projectile urging member in a projectile receiving position;

15

figure 2 is the same as that of figure 1 with the projectile urging member of the ammunition loading assembly in a projectile delivery position;

20

figure 3 is a perspective view of the ammunition loading assembly with the projectile urging member in the projectile receiving position;

figure 4 is a longitudinal sectional side view of figure 3 without showing the projectile;

figure 5 is a detailed view of section A in figure 4; and

figure 6 is a perspective view of part of a drive chain assembly of a drive means for driving the urging member.

### DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Referring to figures 1 to 4, an ammunition loading assembly according to a preferred embodiment of the invention is generally designated by reference numeral 10.

The ammunition loading assembly 10 is suitable for loading a projectile 12 into a barrel 14 of a gun (not shown) and comprises an urging member 16 for urging the projectile 12 into the said barrel 14. The ammunition loading assembly 10 further includes a drive means 18 for driving the urging member 16 between a projectile receiving position (shown in figure 1) outside the barrel 14 and a projectile delivery position (shown in figure 2) inside the chamber 20 of the gun, towards the proximate end of the barrel 14. The drive means 18 includes a drive chain assembly 22, connected to the urging member 16 for driving the urging member 16 between the projectile receiving and delivery positions. The drive means 18 further includes a drive motor (not shown) for driving the drive chain assembly 22. The drive motor includes a drive sprocket

wheel 28, as shown in detail in figures 4 and 5, which engages the drive chain assembly 22.

The drive chain assembly 22 is rigid in all directions but one, the arrangement being such that the drive chain assembly 22 pushes the urging member 16 from the projectile receiving position to the projectile delivery position and pulls the urging member 16 from the projectile deliver position to the projectile receiving position.

Referring to figure 6, the drive chain assembly 22 is constituted of a plurality of chain links 24 pivotally connected to each other. Each chain link 24 is provided with a retaining block 26 for abutting the retaining block 26 of a consecutive chain link 24 for rigidising the drive chain assembly 22 in all directions but one. The arrangement is such that when the drive chain assembly 22 is bent in the said one direction, the retaining blocks 26 are displaced from each other, and when the drive chain assembly 22 is in a linear configuration, adjacent retaining blocks 26 abut each other to limit bending of the drive chain assembly 22 in all but said one direction.

The configuration of the retaining blocks 26 is such that, when the blocks 26 abut each other, the drive chain assembly 22 extends in a loose curve, the arrangement being further such that, in use, the drive chain assembly 22 is stressed by straightening the curve. The retaining blocks each 26 comprises a

base 26.1 for connecting to a chain link 24 and two abutment faces 26.2 extending upwardly from the base 26.1, the configuration being such that the angle between the base 26.1 and each abutment face 26.2 is marginally greater than 90 degrees. In the drawings, for the sake of clarity, only a number  
5 of chain links 24 are shown. However, it will be appreciated that the chain assembly 22 is elongate and has a length of typically between 1 and 3 meters.

Referring particularly to figure 4, the ammunition loading assembly 10 includes a magazine 30 for storing the drive chain assembly 22 when the urging  
10 member 16 is in the projectile receiving position. The magazine 30 includes a polymeric block 32, in the form of polypropylene, which is covered by metal plates 34. The polymeric block 32 defines a curvilinear track 36 along which the drive chain assembly 22 moves when moving the urging member 16 between the projectile delivery position and the projectile receiving position. The  
15 magazine 30 further includes an outlet 31 from which the drive chain assembly 22 enters and exits. The polymeric block 32 is provided with metal reinforcing members 38 located at corners of the track 36. The metal reinforcing members 38 have curved chain guiding faces 40 for guiding the inner end (not shown) of the drive chain assembly 22 around such corners.

20

Referring particularly to figure 5, the ammunition loading assembly 10 further includes first and second chain-retaining devices 42 and 44 respectively. The chain-retaining devices 42 and 44 limit curving of the drive chain assembly 22

out of its linear configuration and guide the chain 22 when moving out of the magazine 30 via the outlet 31, towards the projectile delivery position.

Referring particularly to figure 2, the first chain-retaining device 42 is movable  
5 with the urging member 16 from the projectile receiving position towards a position X, intermediate the projectile receiving and delivery positions, where it is retained from further movement by a retaining means (not shown). The second chain-retaining device 44 is movable with the urging member 16 in a direction towards the projectile delivery position, from a position proximate the  
10 outlet 31 of the magazine 30 to a position Y, offset from the said outlet 31.

The first and second chain-retaining devices 42 and 44 are each provided with sliding members (not shown) for engaging an upper surface of the retaining blocks 26 of the chain assembly 22 in the form of polypropylene blocks (not  
15 shown).

In use, the projectile 12 is disposed in the cradle and moved into concentric alignment with the barrel 14 of the gun. Subsequently, the projectile 12 is engraved in the barrel 14 by activating the drive motor to rotate the sprocket  
20 wheel 28 which in turn moves the drive chain assembly 22 along the track 36 in the direction of arrows Z in figure 4, out of the magazine 30 and thereby pushes the urging member 16 from the projectile receiving position to the projectile delivery position. As the drive chain assembly 22 pushes the urging member



16 towards the barrel 14 via the chamber 20, the first and second chain-retaining devices 42 and 44 are moved concurrently with the drive chain assembly 22 in the same direction. The second chain-retaining device 44 only moves to a position Y, which is offset from the outlet 31 of the magazine 30 while the first chain-retaining device 42 is retained from further movement intermediate the receiving and delivery positions, at position X. The drive chain assembly 22 slides past the first and second chain-retaining devices 42 and 44 and the sliding members engage the upper surface of the retaining blocks 26 thereby guiding the drive chain assembly 22 and keeping the chain 22 in a stressed and linear configuration. The projectile 12 is delivered to the proximate end of the barrel 14 and released by the urging member, stopping just before engraving, so that the projectile engraves on it's own momentum. Thereafter the drive motor reverses to return the chain 22 to the projectile receiving position and collects the chain-retaining devices 42 and 44. The drive chain assembly 22 is therefore moved back along the track 36 of the magazine 30 and the chain-retaining devices 42 and 44 moved back to the position proximate the outlet 31 of the magazine 30. After the projectile 12 is loaded into the barrel 14 of the gun, a charge (not shown) is inserted into the chamber 20 of the gun. The charge is inserted in a similar manner as the projectile.

It is foreseen that the ammunition loading assembly guides the projectile into the barrel of the gun until just before engraving. It is further foreseen that concentric alignment of the projectile with the barrel is relatively easily achieved

since the position and speed of release is controlled. An advantage of the ammunition loading assembly is further that both the projectile and the charge can be loaded. Yet a further advantage of the ammunition loading assembly is that no bounce-back or fall-back occurs since the loading is controlled and the  
5 projectile loaded into the barrel of the gun.

It will be appreciated that variations in detail are possible with an ammunition loading assembly, a gun provided with such an ammunition loading assembly and a drive chain assembly for such an ammunition loading assembly  
10 according to the invention without departing from the scope of this disclosure.

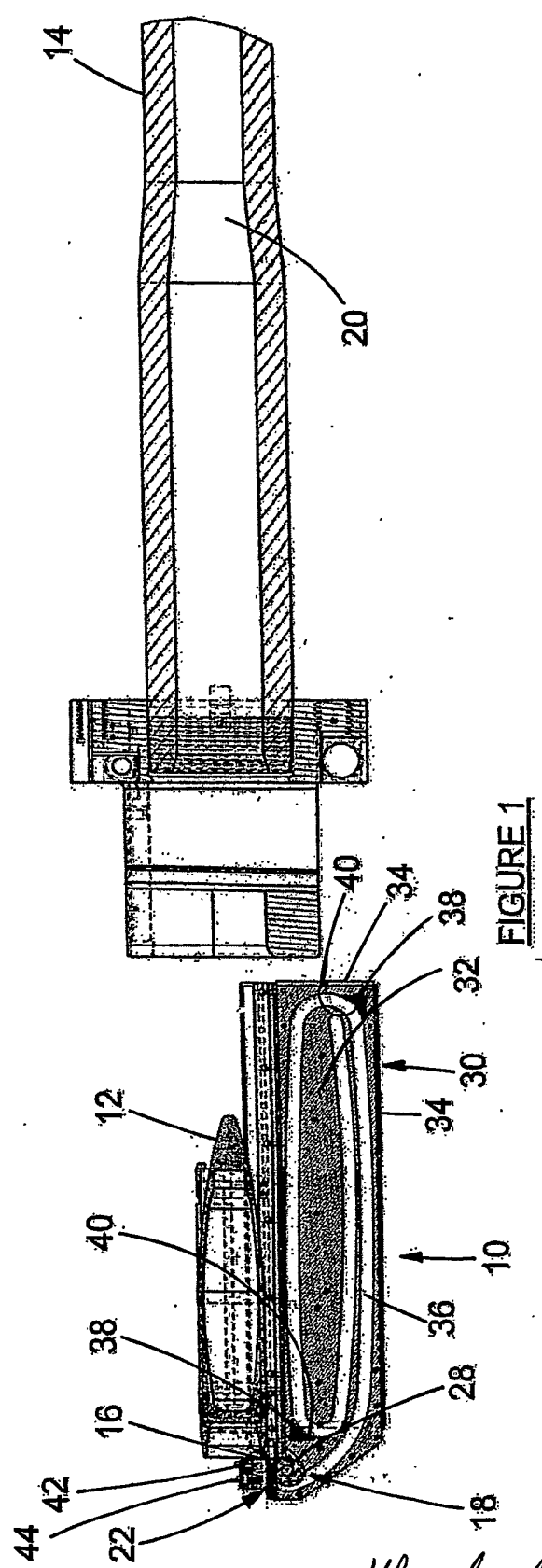
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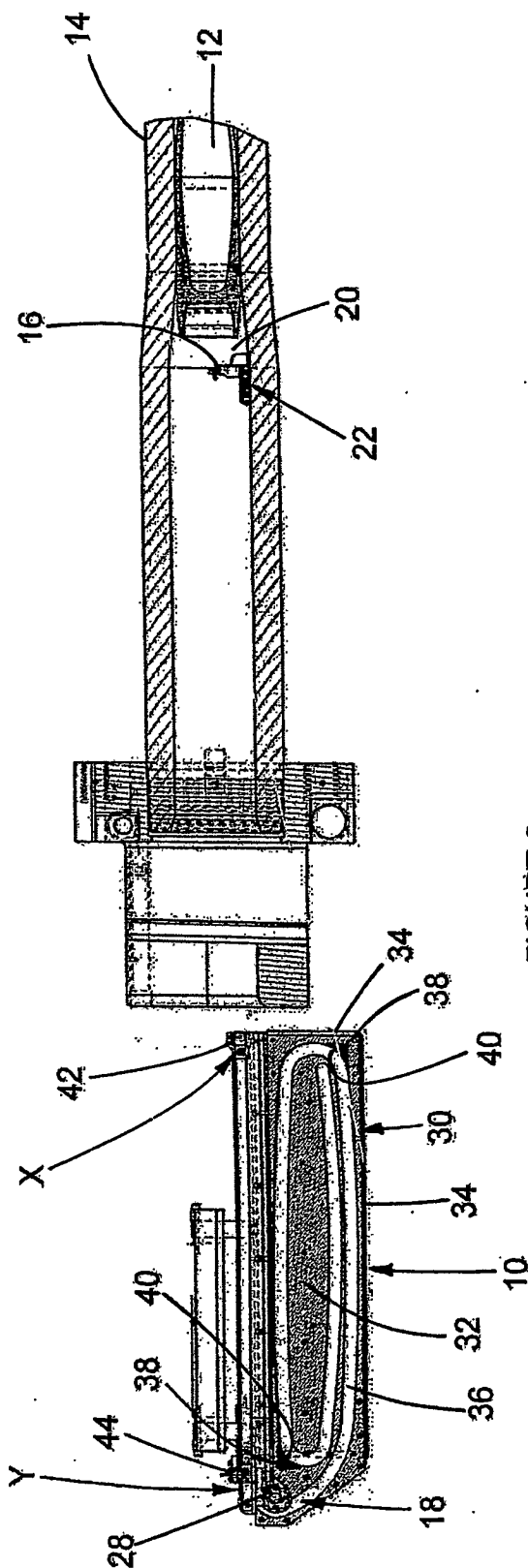


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D M KISCH INC

PATENT ATTORNEYS FOR THE APPLICANT





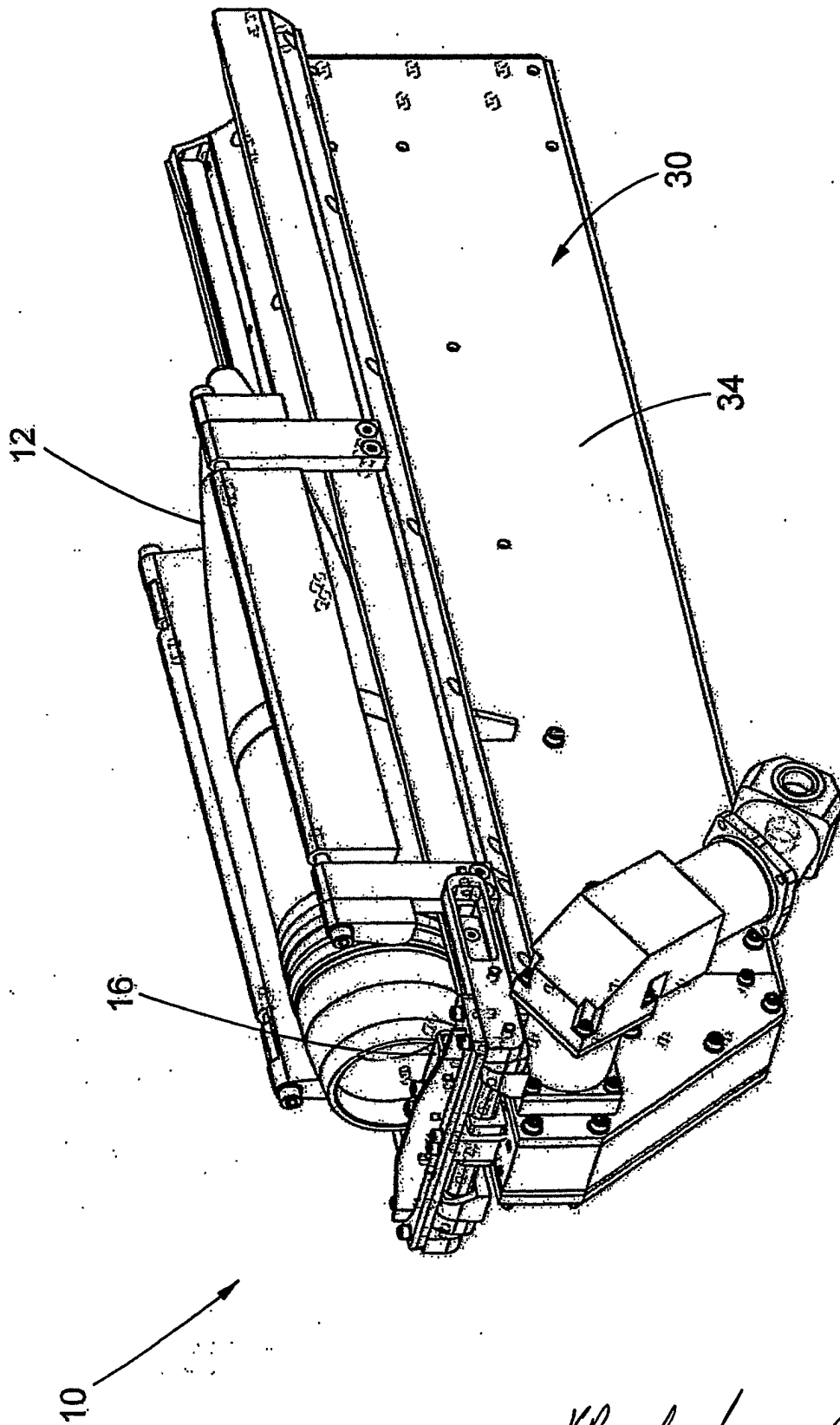


FIGURE 3

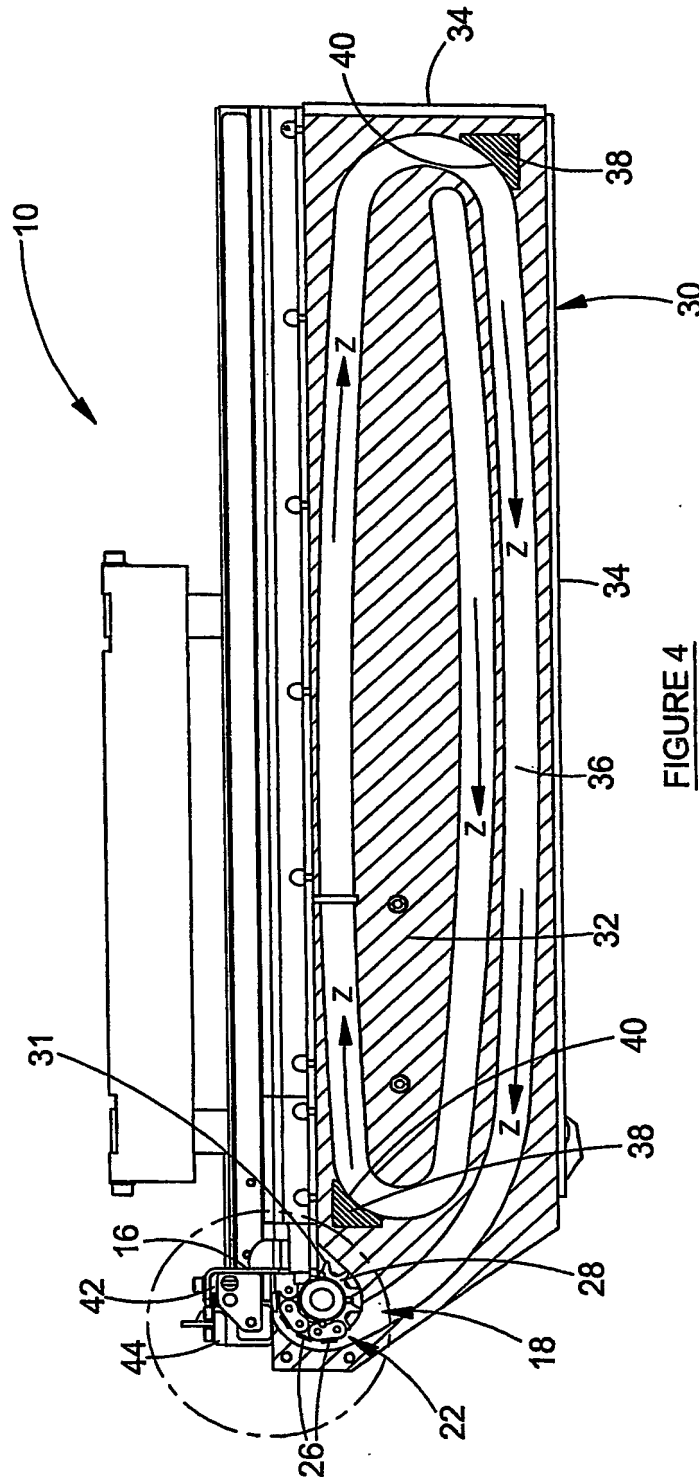


FIGURE 4

*H Breckenridge*

PATENT ATTORNEY FOR THE APPLICANT

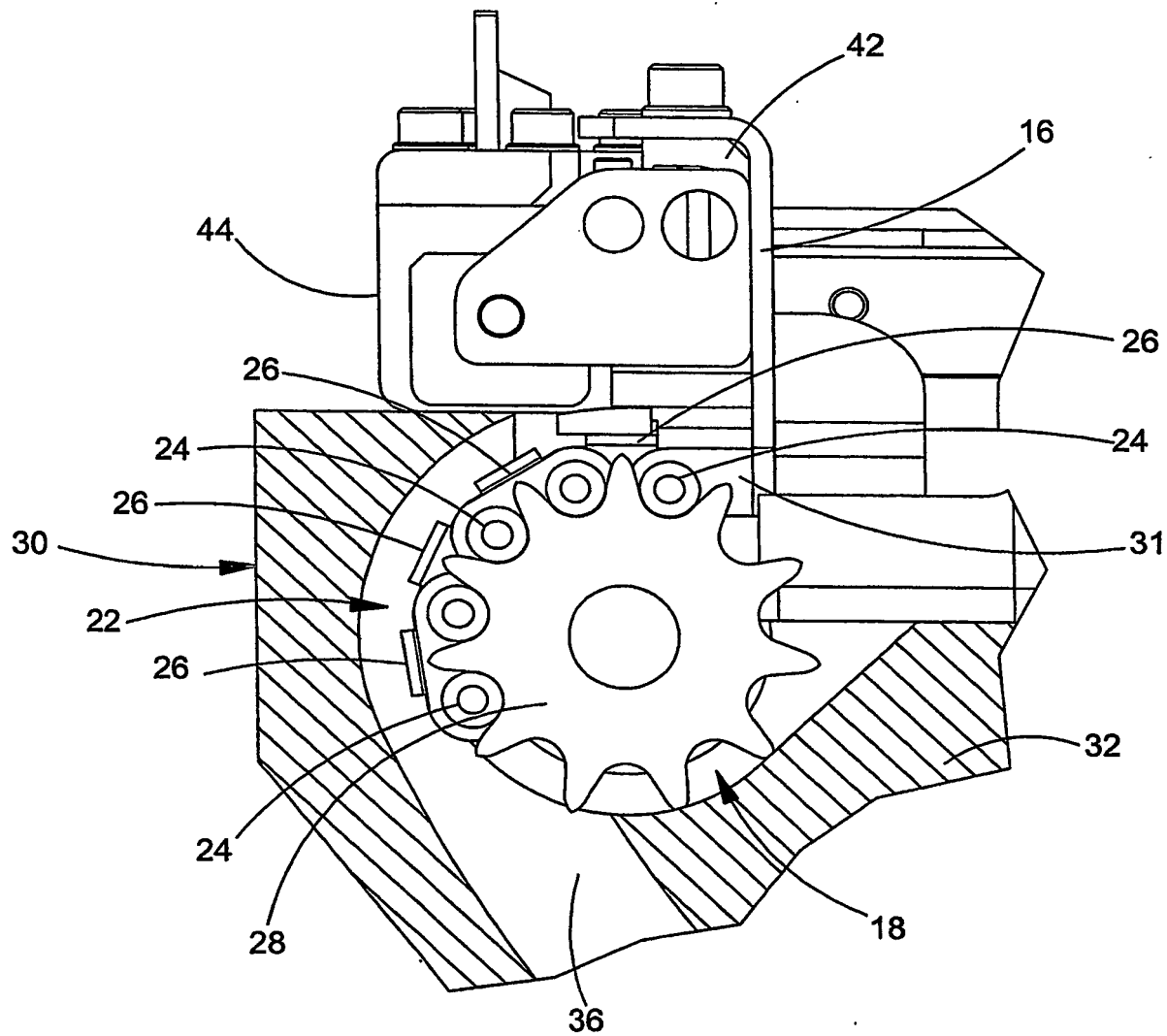


FIGURE 5

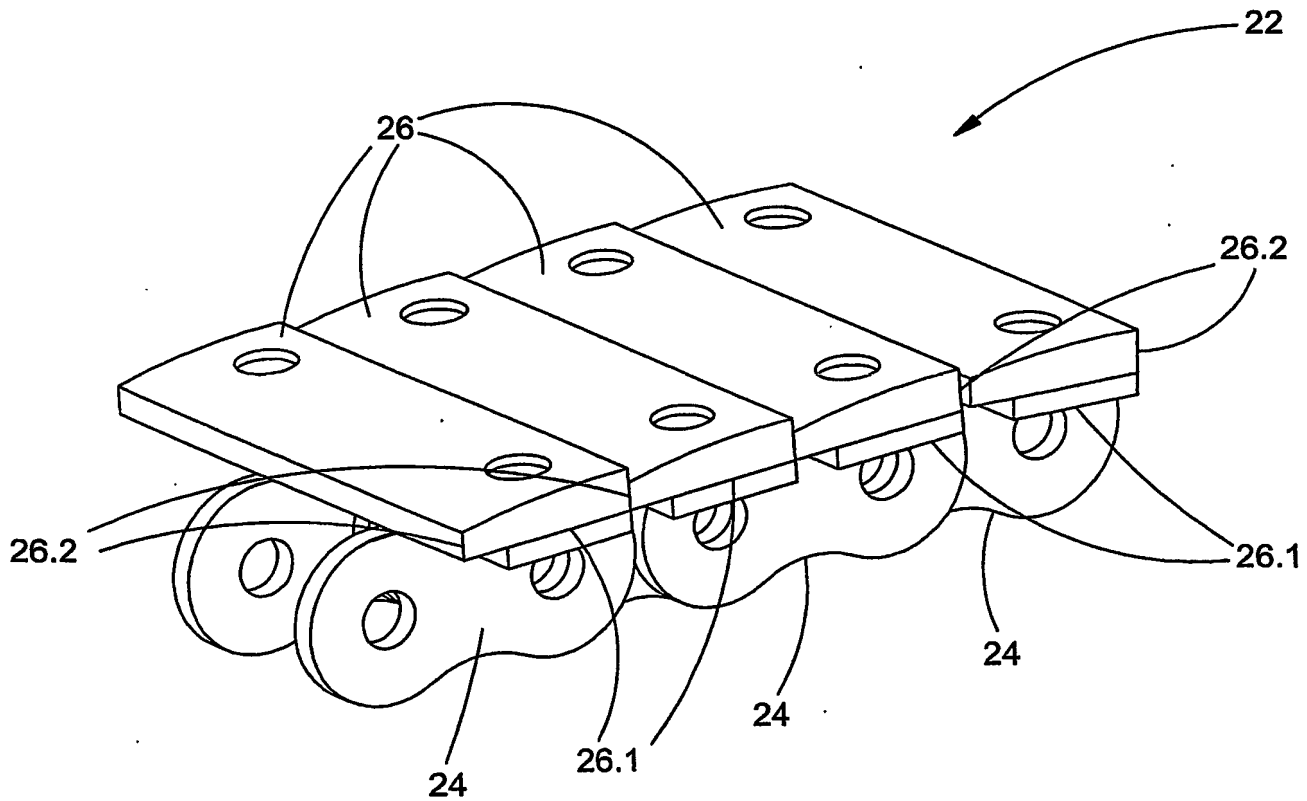


FIGURE 6